



**Eberswalde University
for Sustainable
Development**

Biosphere Reserves Institute

Land systems for sustainability



Week 1: April 09, 2025

Recap of previous session

- Definitions of land, land use, and land cover
- Categories of land use
- Meaning and value of land
- Forest bathing YouTube video



Hidden Losses of India's Solar Parks



https://www.youtube.com/watch?v=oqEM8zSMj_o



Quiz

1. What type of paper is the article?
2. What are the four higher-level facts and how are they related to the lower-level facts?
3. What are the new concepts and terminologies that you learned from the article?

Ten facts about land systems for sustainability

Show Video

Meyfroidt^{a,b,1}, Ariane de Bremond^{c,d,1,2}, Casey M. Ryan^{a,1,2}, Emma Archer^f, Richard Aspinall^g, Abha Chhabra^h, Gilberto Camaraⁱ, Esteve Corbera^{k,l}, Ruth DeFries^m, Sandra Diazⁿ, Jinwei Dong^o, Erle C. Ellis^p, Karl-Heinz Erb^q, Janet A. Fisher^r, Rachael D. Garrett^s, Nancy E. Golubiewski^t, H. Ricardo Grau^u, J. Morgan Grove^v, Helmut Haber^w, Andreas Heinemann^{y,w}, Patrick Hostert^{x,y}, Esteban G. Jobbágy^z, Suzi Kerr^{aa}, Tobias Kuemmerle^{ab,ac}, Eric F. Lambin^{ad,ae}, Sandra Lavorel^{af}, Sharachandra Lele^{ag,ah}, Ole Mertz^{ai}, Peter Messerli^{aj,ak}, Graciela Metternicht^{al}, Darla K. Munroe^{am}, Harini Nagendra^{an}, Jonas Østergaard Nielsen^{ao}, Dennis S. Ojima^{ap,aa}, Dawn Cassandra Parker^{aq}, Unai Pascual^{ar,as,at}, John R. Porter^{au}, Navin Ramankutty^{av}, Anette Reenberg^{aw}, Rinku Roy Chowdhury^{ax}, Karen C. Seto^{ay}, Verena Seufert^{az,ba,bc}, Hideaki Shibata^{bd}, Allison Thomson^{be}, Billie L. Turner II^{bf,ba,aa}, Jotaro Urabe^{bb}, Tom Veldkamp^{bc}, Peter H. Verburg^{bu}, Gete Zeleke^{dd}, and Erasmus K. H. J. zu Ermgassen^{a,b}

Edited by Gretchen Daily, Department of Biology, Stanford University, Stanford, CA; received June 7, 2021; accepted November 13, 2021

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land use | sustainability | social-ecological systems | governance

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The authors declare no competing interest.

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Tip: Text-to-audio freeware



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Tip: Audio-to-text



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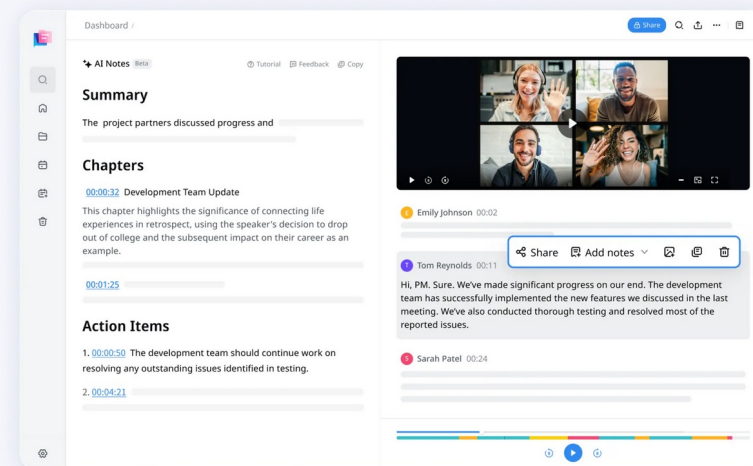
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Works with





Guiding questions to Meyfroidt et al. 2022

1. What type of paper is the article?
2. What are the four higher-level facts and how are they related to the lower-level facts?
3. What are the new concepts and terminologies that you learned from the article?

What type of paper is the article?

- a) Original research
- b) Review article
- c) Case study
- d) Short report or letter
- e) Methodology or methods

Ten facts about land systems for sustainability

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Perspectives should identify a critical science problem, provide a state-of-the-art assessment, and offer new insights or a new approach to its resolution. The narrative style may vary, but each Perspective should focus on an important area of research and be accessible to a broad scientific audience. Perspectives may help contextualize findings within a field or add a new dimension to previously published research. Current advances and novel insights are encouraged. To submit a proposed article, select “Presubmission for Perspective.”

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Connecting Research
and Researchers

Land use is central to addressing sustainability issues

(1) Biodiversity conservation

(2) Climate change

(3) Food security

(4) Poverty alleviation

(5) Sustainable energy

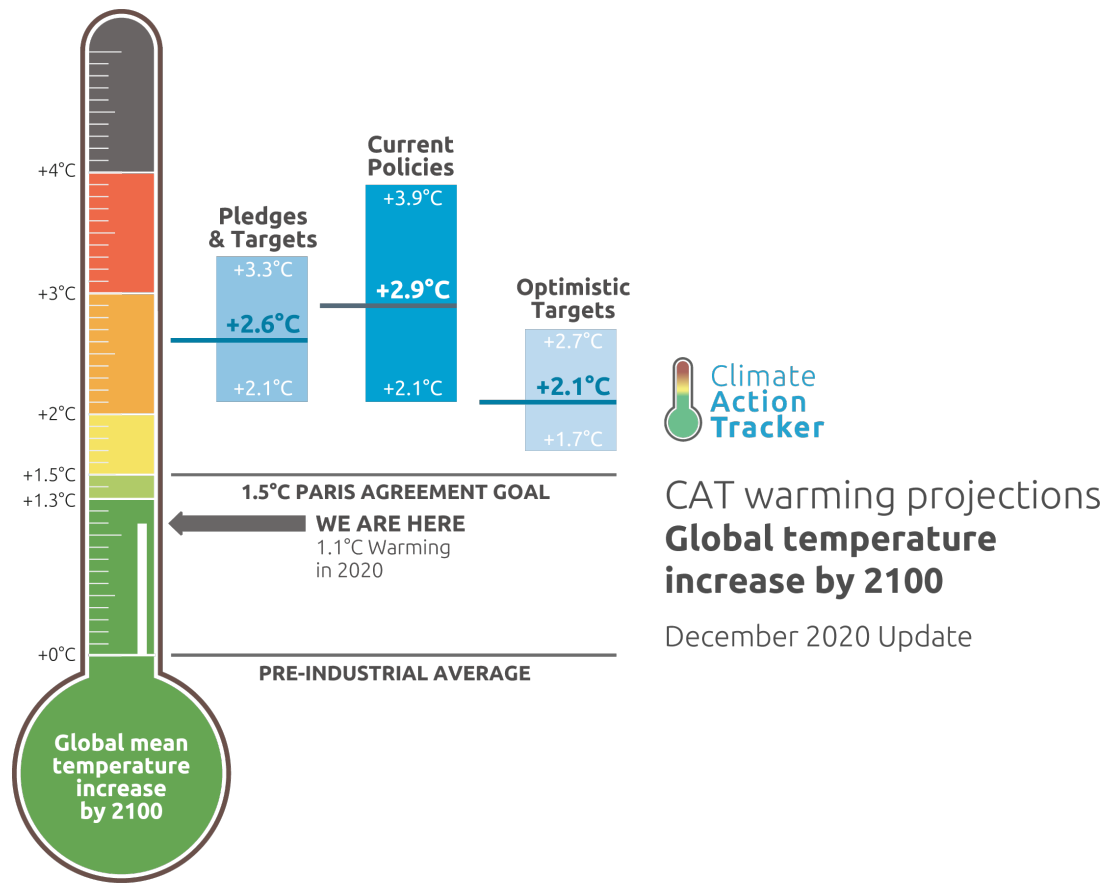


Agenda 2030

SUSTAINABLE DEVELOPMENT GOALS



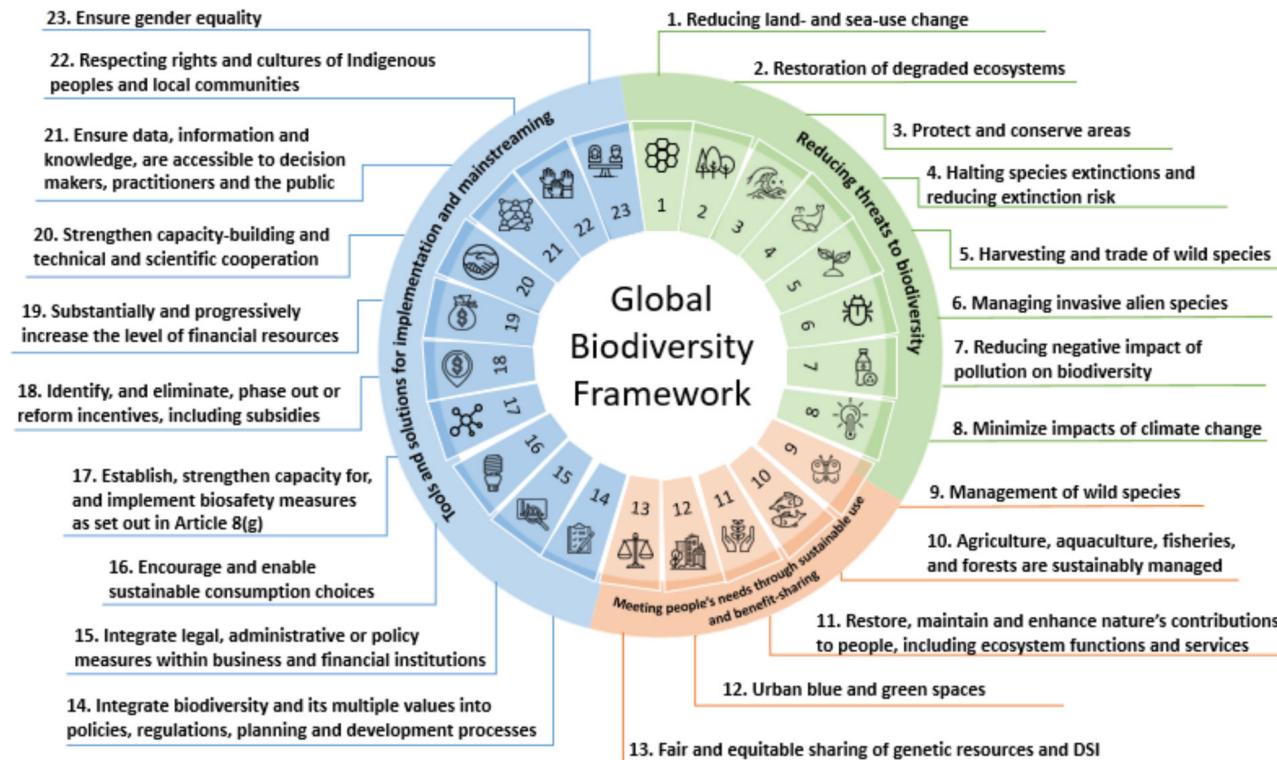
Paris Agreement of the UNFCCC





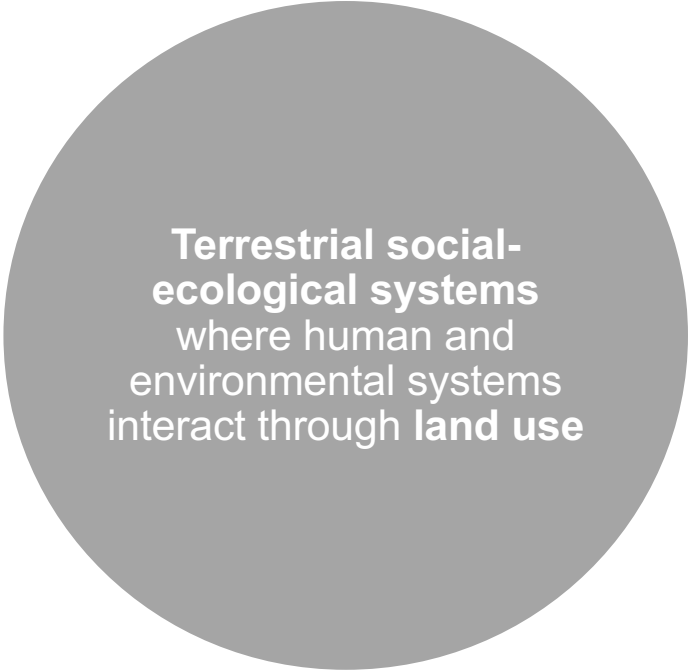
Kunming-Montreal Global Biodiversity Framework

Kunming-Montreal Global Biodiversity Framework Themes and Targets





Land systems

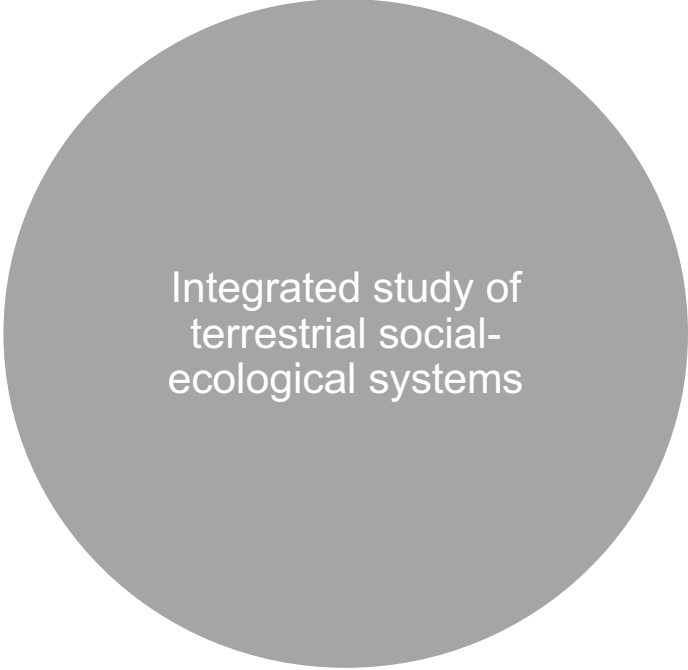


**Terrestrial social-
ecological systems**
where human and
environmental systems
interact through **land use**

Source: Meyfroidt et al. 2022



Land system science (LSS)

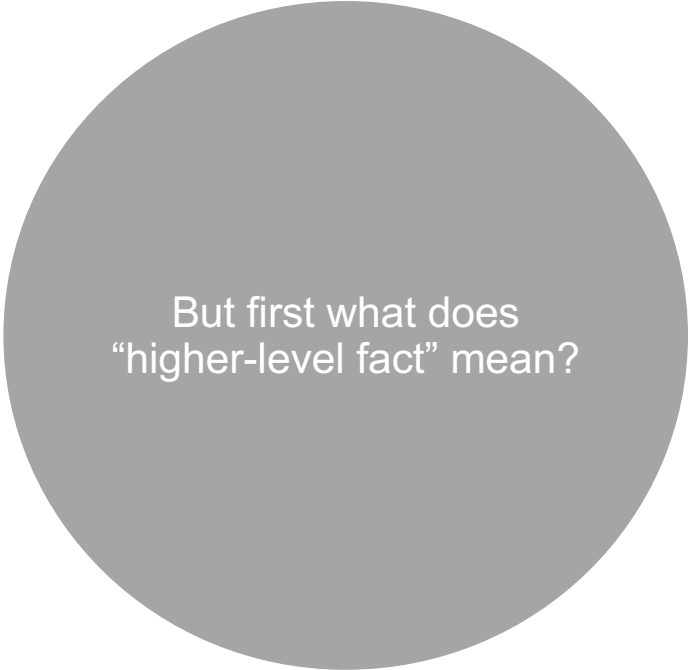


Integrated study of
terrestrial social-
ecological systems

Source: Meyfroidt et al. 2022



What are the four higher-level facts?



But first what does
“higher-level fact” mean?



Higher-level fact

- “Stylized facts” or “empirical regularities” or generalizations supported by a solid body of evidence
- “a conclusion drawn from analysing multiple pieces of evidence or data points. It often involves synthesizing information to understand broader patterns or relationships.”



What are the four higher-level facts?

Basic properties of land systems

Contingent realities

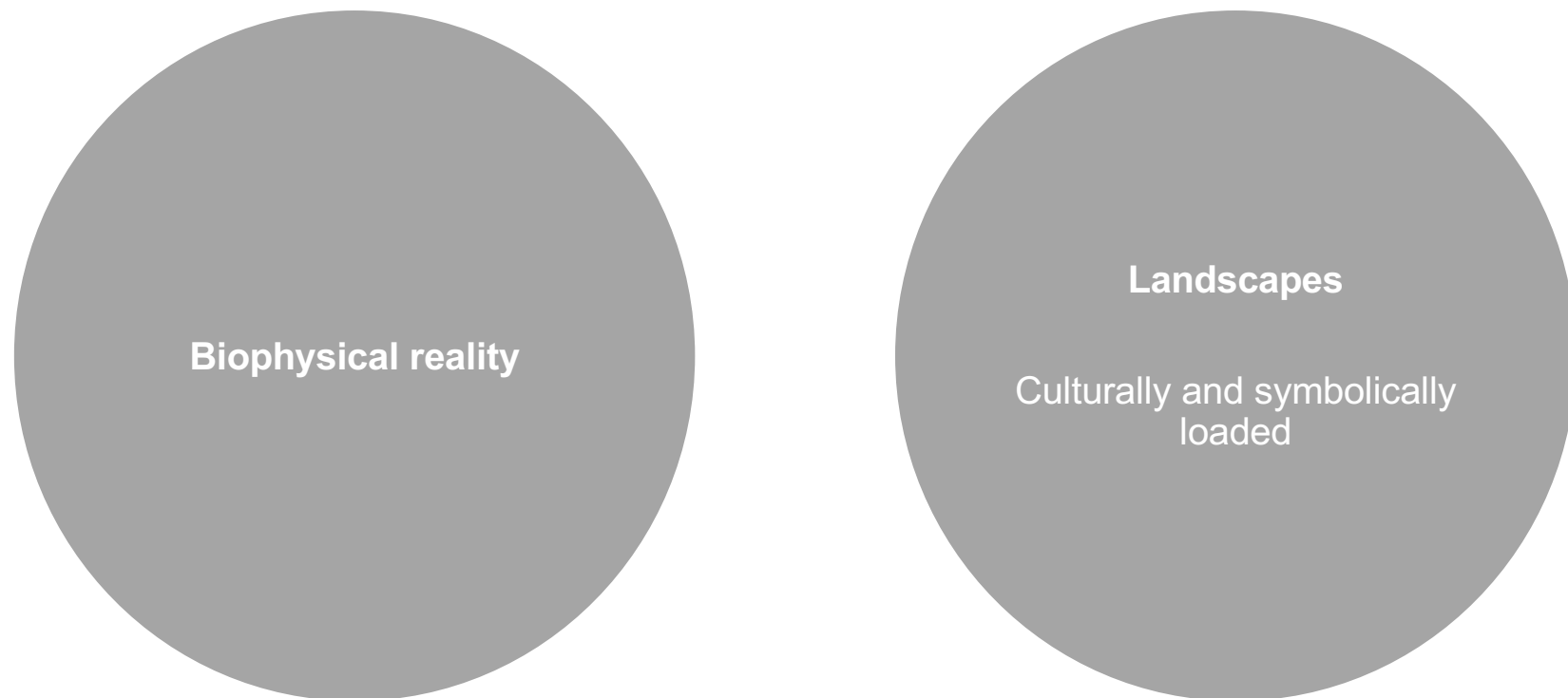
Normative foundations

FACTS about land systems:

- 1** Multiple values and meanings
- 2** Land as complex system
- 3** Irreversibility & path-dependence
- 4** Large impacts of small footprints
- 5** Distant connections
- 6** Used planet
- 7** Prevalence of trade-offs
- 8** Multiple, overlapping, contested land tenure claims
- 9** Unequal distribution of control and benefit
- 10** Multiple dimensions of justice



(1) Meanings & values are socially constructed & contested



Source: Meyfroidt et al. 2022



Embedded in knowledge & belief systems

Source: UNCCD 2017

Faith	Links to environmental thought
Baha'i	Founded by the Persian Baha'u'llah. Believes all religious leaders are manifestations of God and all scripture sacred. Nature and Scripture are the "two books" of revelation. Shoghi Effendi, Baha'u'llah's great-grandson, noted: "Man is organic with the world. His inner life moulds the environment and is itself also deeply affected by it." ¹⁷
Buddhism	Teaches respect for and interconnectedness of nature; plants and animals are included in schemes of salvation. ¹⁸ Gautama Buddha was born, attained enlightenment, and died under trees. Sacred trees are decorated and revered. Buddhism advocates protection, such as ridam in Bhutan, an annual prohibition on entering a designated mountain forest. ¹⁹
Christianity	Teaches that all creation is a loving act of God and that humanity may not destroy God's creations without the risk of destroying itself. St Francis was an early proponent of ecological stewardship. There have been statements by Christian leaders in response to the ecological crisis. ²⁰ Pope Francis published an encyclical in 2015 calling for protection of nature. ²¹
Daoism	Traditionally believed to have been founded by Lao Tzu. Stresses harmonious interaction with the environment, symbolized by a balance between two opposing forces of Yin and Yang. ²² Chuang Tzu, a Daoist scholar, warns against the concept that all nature must be "useful" and stresses its existence value. ²³ Modern interpretation lays stress on ecology.
Hinduism	The earth is revered as Bhumi, "Mother Earth." There are many references to conservation; e.g., the Arthashastra prescribes fines for destroying trees. ²⁴ Damming India's most sacred rivers, the Ganges and Narmada, generated protests partly for faith reasons. ²⁵ During the Chipko movement, women prevented forest loss by surrounding trees with their bodies. ²⁶
Jainism	Jains minimize harm to all life-forms and their teachings stress sympathy and compassion with all life. ²⁷ Mahavira stated: "One who neglects or disregards the existence of earth, air, fire, water and vegetation disregards his own existence which is entwined with them." The Institute of Jainology produced the 1990 Jain Declaration on Nature. ²⁸
Judaism	In the past, reaction to pantheism downgraded the importance of nature, although this is changing. ²⁹ The Tree of Life is one of Judaism's most powerful images. Planting trees has been a widely observed practice, particularly in recent times and the Torah orders creation of green belts around cities (Numbers 35:4). Trees remain a subject of worship in Israel. ³⁰
Islam	The teaching of Allah in the Qur'an states that humans have stewardship over nature, but nature belongs to God. ³¹ Rivers and lakes need a buffer zone, and tree planting and kindness to animals are encouraged. Islam developed the use of Hima, land protection for grazing, bee-keeping, forests, or water, ³² which is still practiced in Jordan and Saudi Arabia. ³³
Shinto	Shinto was the traditional faith of Japan before Buddhism. There are many deities with no formal hierarchy or doctrine but strong links to nature. Ceremonies appeal to the kami, forces of nature in mountains, springs, trees, etc. Sacred groves are important, including both cultivated and natural areas.
Sikhism	Sikhs believe in one God and their sacred writings are contained in the Guru Granth Sahib. Guru Nanak said "Within the Universe, Earth was created to be a shrine." All nature is sacred according to the Sikh faith. Sikhism follows a three hundred year cycle; the current cycle, due to end in 2299, is understood as the "Cycle of Creation" putting an emphasis on environmental practices.
Zoroastrianism	Founded by Zoroaster in modern day Iran. Later, many Zoroastrians moved to India where they are known as Parsis. They regard the earth as sacred, implying that life is also sacred. The decline of vultures in India due to chemical poisoning ³⁴ is a problem for Parsi communities, because the birds are essential to the tradition of disposing of the dead in "Towers of Silence."



Highly contested notion of degradation



https://www.youtube.com/watch?time_continue=1&v=vQa3ZLO9A_8&feature=emb_title

Shifting / swidden cultivation or slash-and-burn farming?

Need to

- Bridge diverse knowledge and value systems
- Promote bottom-up policy agendas that take multiple value systems in consideration

Source: Meyfroidt et al. 2022